1. An apparatus for depositing fluid dots on a receiving surface in an array suitable for microscopic analysis reaction, or the like, comprising a deposit device and a fluid source which are cooperatively related to enable the deposit device to precisely size a drop of fluid of small diameter on a drop-carrying surface of the device, transport mechanism for positioning the device at a precisely referenced lateral position over the receiving surface and drive mechanism for moving the deposit device, relatively, in deposition motion toward and away from the surface, the apparatus adapted, by repeated action, to deposit the drops of fluid precisely in a desired array, preferably the apparatus being computer controlled.

2. The apparatus of claim 1 in which the drop-carrying surface has a diameter less than 375 micron, preferably less than 300 micron, preferably between about 15 and 250 micron.

3. The apparatus of claim 1 or 2 in which the drop-carrying surface is bound by a sharp rim that defines the perimeter of the drop of fluid, preferably the surface defined by the end of a pin or a pin-like structure which has sides that intersect with an end surface to define the rim, preferably the end surface of the pin or pin-like structure being generally flat and the side surfaces are cylindrical and smooth.

4. The apparatus of any of the foregoing claims in which the deposit device is mounted for compliance in the direction of the deposition motion when the deposit device engages the receiving surface, preferably the deposit device being compliantly displaceable by overcoming resistance of a resilient member or weight,

preferably when the deposit device is an axially slidable pin or pin-like structure, the means for urging comprises a coaxial spring or a weight acting on the pin or pin-like structure, preferably the drive mechanism for the deposit device being constructed to overtravel beyond a level at which the deposition device compliantly engages the receiving surface.

5. The apparatus of any of the foregoing claims in which the deposit device, at the time of deposit, is laterally constrained to a reference position; preferably the deposit device being mounted on a flexure system that defines the referenced lateral position of the deposit device; or preferably the deposit device is mounted in a manner permitting its displacement relative to its mounting upon its engagement with the receiving surface, and at the time of engagement of the device with the receiving surface, the deposit device being subjected to a lateral force or turning moment that engages the deposit device with at least one lateral reference surface, preferably the deposit device being a pin or pin-like structure which is free to slide axially, relative to its mounting upon engagement of the pin or pin-like structure with the receiving surface, and is urged against the lateral reference surface by a spring or a weight such as the weight of the device or an eccentric weight or the device being tilted or electrical or magnetic forces act upon the pin or pin-like structure, to produce a lateral force or moment toward the reference surface.

6. The apparatus of any of the foregoing claims in which the fluid source is a mobile fluid storage device that is movable relative to an array of deposit locations, the fluid storage device being constructed and

arranged to resupply the deposit device at various locations along the array, preferably the deposit device and the mobile storage device being constructed to supply drops to the deposit device in the immediate vicinity of the deposit locations for respective drops and preferably being coupled for transverse motion relative to the array and decoupled for movement of the deposit device toward and away from the receiving surface.

7. The apparatus of claim 6 in which a mobile storage device holds a volume of fluid having a free surface into which the deposit device is lowered and raised to obtain a fluid drop, preferably the mobile storage device being constructed to store a multiplicity of isolated fluid volumes in the wells of a multiwell plate, the apparatus constructed to obtain its fluid drop from a selected volume of the plate.

8. The apparatus of claim 6 in which a mobile storage device defines a generally annular fluid retention surface, and the deposit device is constructed to move within the annular retention surface from retracted to extended positions, in the retracted position the drop-carrying surface of the deposit device being retracted from the surface of fluid retained by the annular surface of the storage device, and in the extended position the drop-carrying surface of the deposit device being projected through and beyond the surface of the retained fluid, preferably the deposit device being a pin or pin-like structure mounted within the confines of the annular surface and arranged to move axially relative thereto, and preferably the member defining the annular surface being associated with a driver that moves the member relative to the deposit device to a replenishment volume in which the member is

immersed to receive a supply of fluid, preferably fluid retaining surfaces of the storage device having a hydrophilic surface, e.g., a surface roughness of at least 1000 microinch or a surface energy greater than about 2500 mN/m, preferably the surface comprising tungsten, and preferably e.g. when cooperating with the annular member to pick up a supply of fluid, as from a relatively narrow well, the drop-carrying surface or tip of the deposit device has a surface of surface energy greater than about 2500 mN/m, preferably the surface comprising tungsten, in some cases preferably the annular ring being associated with a heater, e.g., an induction heater.

9. The apparatus of any of the foregoing claims including a cleaning system and a control system adapted to control relative movement of the deposit device to a depositing relationship to the receiving surface and a cleaning relationship to the cleaning system, preferably the deposit device being associated with a mobile supply device that travels with it, the deposit device and mobile supply device being movable together to the cleaning system in response to the control system, preferably the mobile supply device being an annular member through which the deposit device operates, preferably the cleaning system having a nozzle for directing a flow of air past the parts being cleaned, preferably a cleaning or drying station comprising a circular nozzle constructed to discharge a conical flow of fluid against the parts, preferably compressed air, high pressure liquid, aerosol or heated air, preferably the deposit device being a pin or pin-like structure surrounded by a mobile reservoir in the form of an annular member capable of holding a supply of fluid by

surface tension effects, the nozzle directed to dislodge retained fluid, to clean or to dry the respective parts.

10. The apparatus of any of the foregoing claims, comprising a set of at least two of said deposit devices, at least one fluid source for providing a drop of fluid on each deposit device, and mechanism for moving the deposit devices together transversely over an array of spaced apart deposit locations of the receiving surface, preferably there being at least four of the deposit devices comprising a deposit head, preferably including mechanism for moving each deposit device independently, or mechanism for moving the deposit devices simultaneously, relatively, toward and away from the receiving surface to deposit respective drops at respective deposit locations on the receiving surface.

11. The apparatus of claim 10 in which two or more deposit devices are mounted on a common support that is driven by a common driver to deposit respective fluid drops on the receiving surface; preferably each deposit device being associated with a respective annular storage ring, the storage rings being mounted on a common support, driven by a common drive, preferably the spacing of the rings corresponding to the spacing of a multiwell storage plate into which the rings are immersed for resupply; or preferably the spacing of the deposit devices corresponds to the spacing of wells of a multiwell plate fluid source from which the deposit devices obtain fluid directly, preferably the multiwell plate being a mobile fluid supply constructed to accompany the deposit device across the substrate; preferably in either instance, the spacing of the wells of the multiwell plate corresponding to well-to-well

spacing of wells of a 96, 384, 864 or 1536 well plate, or a spacing that is 9 mm or a submultiple of 9 mm.

12. The apparatus of any of the foregoing claims in which the deposit device and its mounting limits the force of engagement of the deposit device upon the receiving surface to less than 1 gram, preferably less than 0.5 gram, preferably to about 0.3 gram, preferably the deposit device having a natural frequency greater than 10Hz, preferably greater than 20Hz, and preferably the motion of the deposit device toward and away from the receiving surface being damped, preferably by friction or by a damping material associated wtih the support of the deposit device.

13. The apparatus of any of the foregoing claims constructed to mount a number of microscope slides or slide-like structures to serve as said receiving surface, and a control system is constructed and arranged to deposit drops of fluid in selected locations on the slides or slide-like structures, preferably the fluid source comprising a source of biological fluid.

14. The apparatus of any of the preceding claims in which a deposit device is a pin or pin-like structure positioned by engagement with a surface of revolution whose axis is disposed at a predetermined relationship to the receiving surface, preferably the surface of revolution being in the form of a supporting ledge that supports the device from moving in its assembly in the direction toward the receiving surface, but from which the device is free to lift in response to contact of the tip of the device with the receiving surface as the supporting ledge and device are together moved relatively toward the receiving surface for depositing a drop,

preferably the surface of revolution having a surface of form substantially matching the form of the portion of the device disposed to engage it, preferably the surfaces being respectively conical, each preferably conforming to a portion of the surface of a right cone.

15. The apparatus of any of the preceding claims in which the deposit device is urged against a reference surface, in which the assembly applies a lateral force or turning moment to the deposit device, preferably the force or the turning moment being applied by a spring that bears eccentrically on the device or by a pushing member engaged with a remote end of the deposit device, one of the engaged end and pushing member comprising a surface set at an acute angle to an axis of the device, and the other of the surfaces comprising a convexly curved surface engaged upon the angled surface, preferably the convexly curved surface defined by a confined ball that bears against the inclined surface, preferably by being pushed by a weight.

16. The deposit apparatus of any of the preceding claims in which the deposit device is in the form of a pin or pin-like structure, wherein a structure prevents rotation of the deposit device about its own axis; preferably the pin or pin-like structure being confined in a complementary space that prevents its rotation about its own axis; or preferably a detent prevents rotation of the deposit device, preferably the detent comprising part of a coil spring which surrounds and is frictionally secured to the pin or pin-like structure, a protrusion of the spring engaging a stop surface that prevents the rotation, preferably the spring also providing axial compliance to the pin or pin-like structure.

17. The method of employing the apparatus or assembly of any of the preceding claims for depositing drops of fluid on a receiving surface or into or onto the bottom of a well or other recipient, or conducting an experiment, preferably employing any of the fluids described in the specification, for any of the purposes described.

18. A method of depositing a biological compound on a substrate or causing a biological compound to interact with another substance at a predetermined position on a substrate, including the step of depositing at least one of the compound or substance in a precisely determined localized spot relative to the substrate by mechanically lowering a compliant deposit device, preferably a compliant pin, or compliant pin-like structure, to which a drop of the compound or substance is held by surface tension, toward the substrate until the deposit device contacts the substrate or a pre-applied compound on the substrate and thereafter mechanically lifting the deposit device away from the substrate under conditions in which the fluid drop transfers to the substrate or the pre-applied compound on the substrate, preferably the deposit device, when approaching the substrate, applying a force to the substrate of less than about 1 gram, preferably less than 0.5 grams, preferably about 0.3 grams and preferably the drop being less than 300 micron in diameter, preferably less than 200 or 100 microns, in some cases preferably superposed drops of both a compound and another substance being successively deposited by the said technique.

19. The method of claim 18 in which a fluid supply of the biological compound or substance to be deposited by a pin or pin-like structure is obtained by

dipping the pin or pin-like structure in fluid, or the deposit device is supported above the substrate at the deposit location within an annular ring holding fluid by surface tension, and the pin is moved through the ring in the manner that a relatively small drop of the fluid supply is held by to the end of the pin or pin-like structure by surface tension, preferably the pin providing a drop-carrying surface bound by a sharp rim that sizes the drop.

20. The method of claim 18 or 19 in which the fluid to be deposited is fluid selected from a group of fluids disposed in a multiwell plate, in cases in which an annular ring supplies the deposit device, the ring traveling to the multiwell plate for resupply, in cases in which the deposit device dips directly into wells, preferably the multiwell plate being mobile, mounted to move across the substrate to be in proximity to the points of deposit.

21. The method of claim 18, 19 or 20 producing arrays of fluid dots comprising providing an array of compliant deposit devices, the devices preferably being in the form of pin or pin-like structures, the devices having spacings corresponding to the well spacing of a 96 well plate, or a plate having a multiple of 96 wells or a spacing of 9 mm or a submultiple of 9 mm; preferably, according to a sampling plan, either dipping mobile annular supply rings into wells of the plate, or dipping the deposit devices directly into wells of the plate to provide fluid drops on the devices and transferring the drops to respective locations in substantially denser arrays on a receiving surface, preferably the drops being deposited on a microscope slide or a membrane supported on a slide-like member in a pattern of square arrays.

22. The method of any of the claims 18-21 comprising, under computer control, moving at least one compliantly mounted pin or pin-like structure having a drop-supporting surface of diameter less than about 375 micron, preferably less than 300 microns, preferably less than 250 micron, to a selected position and depositing, with said pin or pin-like structure, a drop of a desired material.

23. The method of any of the claims 18-22 in which the receiving surface is fragile or soft, preferably the receiving surface being porous or microporous, preferably comprising nitrocellulose, nylon, cellulose acetate, polyvinylidine fluoride or a gel, preferably the member defining the soft or fragile receiving surface being mounted on a rigid carrier member, either directly or upon an intermediate soft or resilient buffer member.

24. The method of any of the claims 18-23 in which the fluid being deposited is a fluid selected from the group of fluids described in the specification, preferably the material being a biological probe or a chemical for reaction with biological material, a fluorescing material, an ink, dye, stain or marker, a photoactive material or a varnish or encapsulant or an etchant, or a cleaning or neutralizing agent.

25. The method of any of the claims 17-24 in which an array of deposits thus formed is microscopically examined with a wide field scanning microscope.

26. An array product comprising deposited dots of fluid of diameter less than about 375 micron, preferably less than 300 micron, preferably between about 15 and 250

micron, in a dense array in a pattern corresponding to a function of the spacing of wells of a 96 well plate, the deposits preferably residing upon a glass microscope slide or on a fragile or soft surface, preferably a porous or microporous surface, the surface preferably comprising nitrocellulose, nylon, cellulose acetate, polyvinylidine fluoride or a gel, the fragile or soft surface preferably mounted on a rigid support.